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Kemp's Ridley Head Start and Sea Turtle Research at the Galveston Laboratory: Annual Report-Fiscal Year 1988

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EXECUTIVE SUMMARY

The National Marine Fisheries Service, Galveston Laboratory's Kemp's Ridley Head Start Research Project completed its tenth year by rearing, tagging and releasing 1,100 turtles of the 1987 year-class on 17 May 1988, off Padre Island, TX. This brought the total number to 13,702 head started turtles tagged and released into the Gulf of Mexico since the project began in 1978.

In July 1988, 925 hatchlings of the 1988 year-class were delivered by the National Park Service to the head start facilities from the Padre Island National Sea Shore near Corpus Christi, Texas, where they had been incubated, hatched and "imprinted," following collection of the eggs at the Rancho Nuevo, Mexico nesting beach. In August 1988, 25 Kemp's ridley hatchlings produced from the captive propagation experiment at Cayman Turtle Farm (1983) Ltd., Grand Cayman, B.W.I., arrived at the facilities for head starting.

The Galveston Laboratory continued its participation in the Sea Turtle Stranding and Salvage Network (STSSN) by documenting strandings of sea turtles along the coasts of Texas and southwest Louisiana on a twice-monthly sampling schedule. Carcasses of dead stranded sea turtles were necropsied to determine sex, reproductive development, food habits and possible cause of death. Debris and entanglement sampling surveys were conducted monthly from West Matagorda Peninsula, TX to the Mermentau River, LA in conjunction with STSSN activities.

During Fiscal Year 1988, the Endangered Species Act was reauthorized by the U. S. Congress and regulations were promulgated requiring Turtle Excluder Devices in shrimp trawls. A Kemp's Ridley Recovery Team was formed and will prepare a recovery plan for the species.

INTRODUCTION

Kemp's ridley sea turtle (Lepidochelys kempi) is the most endangered of the sea turtles. During the 1988 nesting season, only 655 females nested at the principal nesting beach near the village of Rancho Nuevo, Tamaulipas State, Mexico, bordering the western Gulf of Mexico (Richard Byles, U.S. Fish and Wildlife Service, Albuquerque, NM, personal communication, March 1989). In June 1947, an estimated 40,000 nested there in a single day (Hildebrand 1963).

Head starting is an experiment and represents only a small part of an international program aimed at restoring the Kemp's ridley sea turtle population (Klima and McVey 1982; Woody 1986). Its goal was to establish a new nesting colony in the U. S. at the Padre Island National Seashore near Corpus Christi, TX. The working hypothesis for head starting is that eggs and hatchlings become imprinted to their natal beach in such a way that the turtles return as adults to copulate and nest at the same location when mature (Owens, Grassman and Hendrickson 1982). However, this hypothesis remains unproven for any sea turtle species. The Kemp's ridley head start project offers an unique opportunity for testing this hypothesis.

Phases of head starting included collecting, incubating, "imprinting" and hatching the eggs, "imprinting" the hatchlings, rearing the hatchlings in captivity for 9-11 months, and tagging

and releasing the turtles into the wild (Klima and McVey 1982; Mrosovsky 1983; Caillouet 1984; Fontaine et al. 1985, 1989). Survival of the head started turtles during their critical first year of life in captivity is increased as compared to their survival in the wild.

Since 1978, an international team of biologists and volunteers has collected a small portion (< 5%) of the eggs laid during each nesting season at Rancho Nuevo. The Instituto Nacional de la Pesca (INP) of Mexico, the U.S. Fish and Wildlife Service (FWS) and its contractors and volunteers have been primarily involved in this phase. The eggs were collected in plastic bags then placed in polystyrene foam boxes containing sand from the Padre Island beach. In this way, they were not allowed to touch the Rancho Nuevo sand. Boxes containing the eggs were then transferred by aircraft to the National Park Service's (NPS) Padre Island National Seashore. There the eggs were incubated in a hatchery under the surveillance of NPS personnel. Beginning in 1985, incubation temperature was controlled in such a manner that enhanced the proportion of female hatchlings and reduced the likelihood of producing male hatchlings (Shaver et al. 1988).

Upon emergence, hatchlings were taken by NPS personnel to the Padre Island beach and allowed to crawl into the surf where they were scooped up in dip nets and again placed in boxes. After being weighed and measured, the "imprinted" hatchlings were transferred

to the National Marine Fisheries Service's (NMFS), Galveston Laboratory in Galveston, TX, where they were head started for 9-11 months. Most survivors in good health and condition were tagged and released into the Gulf of Mexico. Some were held longer than 1 yr by various cooperating organizations, oceanaria, agencies and universities as a potential brood stock (Caillouet 1984) and as "super head starts" (E. F. Klima, NMFS SEFC Galveston Laboratory, Personal communication, October 1988).

The Kemp's Ridley Working Group, composed of representatives of INP, NMFS, FWS and NPS, held its annual meeting in Brownsville, TX in October 1988. It was concluded at that meeting that enough Kemp's ridleys had been "imprinted" at Padre Island to test the hypothesis of imprinting and to test feasibility of establishing a new nesting colony on Padre Island with head started animals. NPS will increase its beach patrol efforts at the National Seashore during future nesting seasons to search for head started nesters. Future head starting will involve only hatchlings "imprinted" at Rancho Nuevo.

ACCOMPLISHMENTS

As of September 1988, 13,702 Kemp's ridleys representing year-classes 1978-1987, had been head started, tagged and released into the Gulf of Mexico (Table 1). Most had been "imprinted" as eggs and hatchlings to Padre Island, but some were "imprinted" to Rancho Nuevo (Klima and McVey 1982; Owens et al. 1982; Caillouet 1984;

Fontaine and Caillouet 1985; Fontaine et al. 1985, 1989). Growth, migration and survival of the head started, tagged and released turtles have been determined from reports of their recapture or stranding (Manzella, Caillouet and Fontaine 1989; Fontaine et al. 1989). Sporadic nestings of Kemp's ridleys and observations of a few hatchlings in the surf at Padre Island (Donna Shaver, NPS Padre Island National Seashore, Personal Communication, November 1988) have been reported by the NPS since 1979 but to date there has been no evidence that such events are linked to head started Kemp's ridleys.

The stock of captive-reared Kemp's ridleys was established to provide animals for experiments in captive propagation as a "safety net" for the species (Caillouet 1984). Out of 221 captive-reared and tagged Kemp's ridleys distributed among the Cayman Turtle Farm, oceanaria and universities (Table 2), 97 survivors ranging in age from 4 to 10 years old remained as of 30 September 1988. The sex ratio of survivors was 27 males, 26 females and 44 unknown sex. This stock also is a source of "super head started" individuals for future release as well as providing opportunities for studies of tag retention/recognition, reproductive physiology, morphometry, etc. Since 1984, the captive females at Cayman Turtle Farm have nested, and viable hatchlings were produced in 1986, 1987 and 1988(James and Fern Wood, Cayman Turtle Farm, Personal Communication, December 1988). Some of the hatchlings from the 1987 and 1988 year-classes were head started in Galveston. Responsibility for the captive stock was transferred from NMFS to

FWS following the meeting of the Kemp's Ridley Working Group in October 1988.

A few head started Kemp's ridleys that were stunted, otherwise abnormal, incurably sick, or permanently handicapped by injuries were used in research, transferred to other organizations, agencies or investigators, or euthanized (Fontaine et al. 1985, 1989).

Gonads and kidneys were routinely excised from Kemp's ridleys that died during head starting so that sex of these turtles could be determined histologically (Wibbels et al. 1985). This provided NPS with information necessary to determine the relationship between incubation temperature and sex ratio in Kemp's ridley (Shaver et al. 1988). For the first time, DNA analyses based on blood samples from live individuals were used to determine sex in Kemp's ridleys (Demas et al. 1989; Duronslet et al. 1989) in co-operation with the Center for Reproductive Biology, Collierville, TN.

The study of swimming speed and stamina in head started Kemp's ridley was completed (Stabenau 1988), and Erich Stabenau is now a graduate student in the University of Texas Medical Branch, Galveston, TX. Stabenau will be extending his study to an investigation of stress physiology in Kemp's ridley. This investigation will utilize the exercise flume designed to induce swimming and to test stamina in sea turtles.

Participation in the Sea Turtle Stranding and Salvage Network (STSSN) resulted in the recovery of 19 live-stranded sea turtles in FY88, including 8 Kemp's ridleys. The remainder consisted of

7 Loggerheads, 3 Hawksbills and 1 Green. Seven of the turtles (including 1 Kemp's Ridley) died and 11 (including 6 Ridley's) were released after rehabilitation at the head start facilities. One Kemp's Ridley is still under observation. Some of the turtles were tagged with radio- and sonic-transmitters and tracked when released. Carcasses of various species of sea turtles were necropsied to determine probable cause of death and to make biological observations and measurements. Surveys of beach debris and entanglement of sea turtles in marine debris were "piggy-backed" on STSSN surveys in the area from West Matagorda Peninsula, TX to the Mermentau River, LA.

HEAD START FACILITIES AND OPERATIONS

Head start facilities and operations have been described in detail by Fontaine et al. (1985) and updated by Fontaine et al. (1989). Testing of the exercise flume system will be conducted in fiscal year 1989 and represents the only refinement now being investigated in head start operations.

1987 YEAR-CLASS

Hatchlings Received

During 6-23 July 1987, 1,282 "imprinted" Kemp's ridley hatchlings representing 20 clutches were received from the NPS' Padre Island National Seashore (Manzella et al. 1988, Table 13). Four were dead on arrival (ibid., Table 14). The incubating, hatching, "imprinting," packing and transporting operations were carried out by the staff at the National Seashore (Shaver et al. 1987). All of the clutches came from eggs collected in the usual manner at the Rancho Nuevo beach.

The eggs of the 1987 year-class were incubated at the National Seashore at temperatures between 29.7 and 32.9°C (Shaver et al. 1987). Sex in Kemp's ridley is influenced by incubation temperature, with the pivotal temperature (that producing a 1:1 F:M sex ratio) being approximately 30°-31°C (Shaver et al. 1988). Therefore, the sex ratio of the 1987 year-class should have been female-biased, and examination of hatchlings that died during the

year did indicate a female-bias (242:1 F:M Jenny Bjork, National Park Service, Padre Island National Seashore, TX, Personal Communication, March 1989).

Distribution of Hatchlings Among the Raceways

As the clutches of hatchlings of the 1987 year-class were received, they were assigned more or less sequentially to the raceways from east to west (Manzella et al. 1988, Appendix Table 1).

Schedule for Weighing and Measuring Turtles

All hatchlings of the 1987 year-class were weighed (Manzella et al. 1988, Table 17) and measured (carapace length and width) at the National Seashore by NPS personnel between 5 and 23 July 1987. Thereafter, at the Galveston Laboratory, random samples of turtles (25 per raceway) were taken for weighing at approximately 28-day intervals and all surviving turtles were weighed and measured before their release (Table 3).

Foods and Feeding

The foods and feeding methods used in head starting Kemp's ridleys were elaborated by Fontaine et al. (1985) and Caillouet et al. (1986). The food used in head starting the 1987 year-class was a dry, floating, pelleted, diet manufactured by Purina, Richland, IN. It is the same diet used for rearing green sea turtles (Chelonia mydas) at the Cayman Turtle Farm (1983), Ltd. (James

Wood, Cayman Turtle Farm, personal communication, August 1984).

Health Care

Health care for the head started turtles consisted of prophylactic and therapeutic measures developed from previous research and experience (Clary and Leong 1984; Fontaine et al. 1985; Leong et al. 1989). The Texas Veterinary Medical Diagnostic Laboratory Systems, College Station, TX conducted necropsies on some of the turtles that died during head starting. For the 1987 year-class, cause of death usually was bacterial infections. Also during the year, a few turtles were provided medical treatment by Dr. Joseph Flanagan, DVM, Houston Zoo, Houston, TX. Usually turtles were treated for bacterial infections. Overall, the 1987 year-class exhibited few maladies, and survival to release was 89.9%.

Environmental Variables

During head starting of the 1987 year-class of Kemp's ridleys, seawater temperature, salinity and pH were monitored in selected raceways beginning 16 July 1987 and ending 16 May 1988. These measurements served as general guides to environmental conditions in the raceways. Mean temperature, salinity and pH by raceway and month are presented in Table 4.

Mean temperatures by raceway ranged from 25.5°C to 28.7°C and reflected the location of the raceways in the quonset huts. Those raceways near the doors of the quonset huts had cooler mean temperatures. For the entire year means and ranges in temperature,

salinity and pH were 26.7°C (21.0-31.0°C), 28.7 ppt (20-36 ppt) and 7.3 (6.7-8.5), respectively.

The only environmental variable we controlled was seawater temperature. The heating of the air in the quonset huts with forced-air heaters and the incoming seawater with immersion heaters during winter obviously stabilized the temperature in the raceways quite well.

Tags and Tagging

Tags were applied to all Kemp's ridleys of 1987 year-class that were healthy (Table 5). Types of tags included: inconel flipper tags, living-tags, and internal, binary-coded magnetic tags (Fontaine et al. 1989). Inconel flipper tags were applied to the trailing edge of the right front flipper. The flipper tag code series included PPR001-PPR999 and PPS001-PPS101. Living tags were applied to right costal scute 1 (Fontaine et al. 1988). Binary-coded, magnetic tags were inserted into the distal end of the left front flipper.

Anyone encountering a tagged or marked Kemp's ridley should contact the NMFS Miami Laboratory, 75 Virginia Beach Drive, Miami, FL 33149 (commercial telephone no. 305-361-4488, -4225, or -4487), or NMFS Galveston Laboratory, 4700 Avenue U, Galveston, TX 77550 (commercial telephone no. 409-766-3523, -3516, -3507, -3525). The location and number of the tag or mark, and measurements (straight line) of the carapace length and width, weight of the turtle, location, date and method of recapture, sighting or stranding

should be reported to NMFS.

Release

On 17 May 1988, 1,100 multi-tagged Kemp's ridleys of the 1987 year-class were packed into wax-coated, corrugated cardboard boxes and transported by truck to the University of Texas' Marine Science Institute at Port Aransas, TX. A total of 54 multi-tagged turtles of the 1987 year-class remained at the laboratory (Table 6) for preconditioning in the exercise flume system for use in testing turtle excluder devices (TEDs) in west Florida during spring 1989. Also 50 multi-tagged "super head started" Kemp's ridleys of the 1986 year-class were packed and transported as well. A total of 49 multi-tagged individual of the 1986 year-class also were held back (Table 6) for preconditioning. Also released at this time were 130 1987 year-class Kemp's ridleys hatched at Cayman Turtle Farm, on Grand Cayman Island from eggs laid by adults. These were also head started in Galveston for 9 months prior to their release. All turtles to be released were transferred to the University of Texas' research vessel LONGHORN and from there to the release site in the Gulf of Mexico about 12 nautical mi off Padre Island. All turtles were alive and appeared to be in good condition at the time of their release. As has been observed in previous offshore releases most of the turtles floated on the surface for a short time before diving.

Finally, also included in the May 1988 release were 113 1987 year-class and 26 1986 year-class loggerhead sea turtles (Caretta). They were originally received as hatchlings (124) and yearlings

(28) from the Florida Department of Natural Resources.

SUMMARY OF HEAD STARTED KEMP'S RIDLEY SEA TURTLE RELEASES AND RECOVERIES

Table 7 summarizes release data for head started Kemp's ridley year-classes 1978-1987.

Of the 13,702 tagged Kemp's ridleys released, 587 had been recovered as of 30 September 1988 (Table 8). Most of these were from the 1982 year-class in which many turtles had been contaminated with oil. They had washed ashore at Padre Island shortly after their release about 4 nautical mi offshore. The smallest number of recoveries (8) were from the 1987 year-class which had been at sea only 4 months. Also, many of the 115 recaptures of the 1985 year-class were caught within the bays in which they were released, or in adjacent bays, shortly after their release.

Most of the recoveries have occurred in Texas (Table 9) near the release site. Louisiana and Florida ranked second and third in number of recoveries, followed by North Carolina and South Carolina, respectively. A few turtles (3) have been recovered as far away as France and Morocco (Manzella et al. 1988, 1989).

In many cases (21%), the method of recovery was not reported (Table 10). Of the reported methods of recovery, three dominated: stranded dead (25%), shrimp trawl (23%) and stranded alive (18%). Of the trawl-caught recoveries (Table 11), most were reported from Texas (51%) and Louisiana (29%). Table 12 shows the condition of the tagged sea turtles at the time of their recovery. More than

half (59%) of the turtles were reported as being recovered alive and released back into the environment.

1988 YEAR-CLASS

Hatchlings Received

Between 13-20 July 1988, 925 Padre Island-"imprinted" Kemp's ridley hatchlings of the 1988 year-class were received from the NPS's Padre Island National Seashore (Table 1). These hatchlings were from 10 clutches collected in the usual manner from the Rancho Nuevo beach (Table 13). None were dead on arrival. A summary of live vs dead hatchlings received from the NPS is presented in Table 14.

Table 15 gives the origin, identification number and history of each clutch. The hatchlings were "imprinted" (Table 16) weighed (Table 17) and measured (carapace length and width) at the National Seashore by NPS personnel (Donna Shaver, National Park Service, Padre Island National Seashore, TX, personal communication, 1 August 1988). The actual and proposed dates and sample sizes for weighing of Kemp's ridleys of the 1987 and 1988 year-classes are given in Table 18.

Captive Propagation

In 1988, 11 Kemp's ridleys nested at the Cayman Turtle Farm producing a total of 15 nests (James Wood, personal communication, July 1988). A total of 1,525 eggs were laid, producing 45

hatchlings for a hatching success of 3%. On 14 July 1988, 25 of the 26 hatchlings surviving at that time were imported to the head start facility. None were dead on arrival. They are being reared in the quarantine shed at the head start facility in Galveston. Green sea turtles (Chelonia mydas) at the Cayman Farm are known to be susceptible to several herpes viruses, but there has been no evidence that Kemp's ridley at the farm or those transferred from the farm to the head start facilities contract such viruses. Nevertheless, the Kemp's Ridley Working Group agreed that such turtles be head started for 9-10 months under quarantine procedures. If no herpes virus showed up in these turtles during the quarantine period, then they could be tagged and released along with the current year-class of head started Kemp's ridleys from Rancho Nuevo stock. To date, no evidence of herpes virus has been observed in Kemp's ridleys received from the farm, including 1987 and 1988 year classes.

The production of Kemp's ridley hatchlings at the turtle farm and their export to the U.S. have proven that captive propagation is feasible. Therefore, the Kemp's Ridley Working Group decided that no more hatchlings will be produced at the turtle farm for export to the U.S., and that the 1988 year-class will be the last of those head started at the Galveston Laboratory.

All facilities holding captive Kemp's ridleys were contacted in fiscal year 1988 to obtain information on mating, attempted mating, or other courtship behavior. Of the five facilities holding 1982 year-class Kemp's Ridleys, only Clearwater Marine

Science Center, Clearwater, Florida, reported nesting. One female deposited 49 eggs in three different nests. Of those eggs only 2 hatched, and 1 died within 30 days. Theater of the Sea in Islamorada, Florida reported that one female dropped 8 eggs in the holding tank. The turtles were immediately moved to a tank with an adjacent nesting beach but nesting did not occur during the 1988 season.

Dr. David Owens, Department of Biology, Texas A&M University has also participated in captive propagation experiments on Kemp's ridleys by conducting reproductive physiology studies on the captive stock. During December 1988, 12 of the Kemp's ridleys formerly at Sea-Arama Marineworld were transferred to Sea World of Texas, in San Antonio where Owens will continue his experiments.

OTHER ACTIVITIES

By-Catch of Sea Turtles in Shrimp Trawls

Two sea turtle by-catch data files are being maintained at the Galveston Laboratory. One is a subset of the recovery data file for head started-tagged Kemp's ridleys and the other is a data file for wild turtles of all species.

As of 30 September 1988, 137 (23.4% of all recoveries) head started Kemp's ridleys had been caught in shrimp trawls. These recoveries were reported by shrimpers who caught the turtles or by NMFS port agents who knew how they had been captured. Most (58.8%) were reported as alive and released when caught. Texas and Louisiana led other states in incidental catch of head started

Kemp's ridleys in shrimp trawls.

The by-catch data file for non-head started turtles contains data on wild turtles caught and reported by shrimpers. Some of the turtles were reported during the 1986 and 1987 Texas Closures; it was mandatory for shrimpers to report any turtles they caught during those closures. There were 26 records of wild, shrimp trawl-caught sea turtles in the data file as of 30 September 1988: 10 loggerheads, 10 Kemp's ridleys, 1 hawksbill (Eretmochelys imbricata), 1 leatherback (Dermochelys coriacea) and 4 unidentified. Twenty-one were reported as being alive when caught: 2 were reported dead, and for 3 the status was not reported. Sixteen turtles were caught in Texas waters, 5 from Louisiana, 3 from Georgia and 1 each from South Carolina and Florida.

Under the Endangered Species Act reauthorized in 1988, NMFS is implementing regulations effective on 1 May 1989 requiring mandatory use of TEDs (Turtle Excluder Devices or Trawling Efficiency Devices) on offshore trawlers in the Gulf of Mexico and Atlantic coast to reduce by-catch and kill of sea turtles in shrimp trawls (USDOC, NOAA, NMFS 1988). The regulations will be extended to include inshore trawlers (with a 90 minute tow-time option) beginning 1 May 1990.

Sea Turtle Sightings

The Galveston Laboratory maintains a sea turtle sighting data file. A sighting is an event in which a sea turtle is seen, usually swimming at the surface. Sea turtle strandings or turtles

caught in trawls are excluded from this file. Some of the sightings were reported by divers belonging to dive clubs and some have been reported by oil companies who are cooperating with the Galveston Laboratory or by NMFS observers on oil rig severance and salvage operations. Other sightings were made by other NMFS employees, and by boat operators, fishermen, and the general public who reported the sightings.

As of 30 September 1988, there were 83 sighting observations in the file. Four species were represented: 2 leatherbacks, 33 loggerheads, 10 Kemp's ridleys and 6 greens. An additional 32 sightings were made, but no species identification was possible. Sightings were reported from Alabama, Florida, Louisiana and Texas. Seventy-seven of the turtles were alive, 2 were dead, and 4 reports did not indicate whether the turtles were dead or alive. Of the 83 sightings, 56 were associated with a type of structure such as an oil platform, dock, or shrimp boat, etc.

Sea Turtle Stranding and Salvage Network (STSSN)

The Galveston Laboratory continued its participation in the NMFS STSSN, with a focus on the coasts of Texas and southwest Louisiana. The twice-monthly systematic survey covers the entire Texas coast from the Rio Grande River to the Sabine River (excluding the Padre Island National Seashore covered by NPS, and the Wynn Ranch covered by FWS on Matagorda Island) and the southwest Louisiana coast from the Sabine River to the Mermentau River. From October 1987 through September 1988, 187 sea turtles were found

stranded in the survey area (Table 19).

Conducting beach surveys every two weeks increased the chances that stranded turtles were found before they were redistributed by tides, destroyed by decomposition and carrion feeders, or mutilated or removed by man. The survey area is divided into six zones, each of which is traversed twice each month, using 4-wheel drive vehicles, 4-wheel all-terrain-vehicles, or dirt bikes, depending upon remoteness and accessibility. In addition, reports from the public concerning strandings are responded to by Galveston Laboratory STSSN participants who collect the data and salvage the specimens. Some of the salvaged specimens are necropsied by Texas A&M University graduate students.

Aerial reconnaissance surveys for sea turtle strandings were conducted from 1 May 1988 through 29 September 1988. Surveys were made in conjunction with Coast Guard helicopter training flights within the Galveston, Matagorda, San Antonio and Corpus Christi Bay systems. Only one stranded marine mammal was found 10 May 1988, represented by a dolphin on the shoreline of Corpus Christi Bay. The aerial surveys will resume in May 1989.

Strandings of hundreds of sea turtles on beaches bordering the Gulf of Mexico each year are symptomatic of something radically wrong in the coastal ecosystem of which sea turtles are a part. Either man's at-sea activities or major changes in the biotic and abiotic conditions within the sea turtles' natural environment or

both are stressing sea turtles and causing their mortalities. NMFS has concluded that one of the major causes of strandings is incidental capture and kill of sea turtles in shrimp trawls (Henwood and Stuntz 1987). Based on direct observations made on board commercial shrimp boats, NMFS has estimated incidental take and kill of thousands of sea turtles per year in the Gulf of Mexico. Even those sea turtles that survive entrainment in shrimp trawls and are returned to the water may be so weakened and stressed by the experience that they succumb to predators or die from other causes. Juvenile sea turtles frequent the estuaries and shallow near shore zone, especially in warm months. There is some evidence, from stomach contents analysis of stranded animals, that the turtles may be pursuing crabs and shrimp as natural prey or scavenging on crustacean and finfish by-catch discarded by shrimpers or both (Ruckdeschel and Shoop 1988).

Hook-and-line fishermen, both commercial and recreational, occasionally catch sea turtles, either as direct by-catch (hooking) or through entanglement in discarded monofilament line. Sea turtles are thought to be injured or killed by underwater explosions associated with petroleum platform severance and salvage operations (Klima, Gitschlag and Renaud 1988). Ingestion of debris, especially plastics and tar balls, and collisions with boats or their propellers are additional causes of sea turtle injury and mortality, as are a number of other causes of minor significance (Heinly et al. 1988; Plotkin and Amos 1988).

Systematic beach sampling surveys not only provide a means of

quantifying the species, numbers, and sizes of stranded sea turtles, but also provide valuable information concerning life history and possible causes of sea turtle mortality. The temporal-spatial distribution and habitat selection of sea turtles can be surmised from strandings in combination with information on ocean currents, stomach contents, and sessile organisms (e.g., barnacles, etc.) growing on their shells. The landfall of stranded turtles most likely depends upon location where turtles were injured or killed, and if killed, how long it takes the carcass to swell with gas and float as well as the direction and speed of prevailing surface currents that carry it to shore. Carcasses can also be redistributed by tides.

Sea turtle carcasses have been collected and necropsied in hopes of determining probable cause of death. Necropsies also provide valuable biological data on sex, reproductive development and food habits. A total of 74 necropsies were performed from October 1987 through September 1988. Forty six necropsies were performed by NMFS observers at Texas A&M University Galveston, 18 by NMFS observers at Institute of Marine Science in Port Aransas, 9 by the Texas Veterinary Medical Diagnostic Laboratory Systems and 1 by veterinarians at the Houston zoo. Stomach contents were removed from 55 animals and sexes were positively identified in 22 loggerheads (17 F, 5 M), 16 Kemp's ridley (11 F, 5 M) and 1 green, a male. Despite these efforts and those of the previous two fiscal years, cause of death could rarely be determined from a stranded

sea turtle carcass. Usually there was too much tissue decomposition to firmly establish a cause of death. Therefore, the Galveston Laboratory has terminated necropsies of sea turtle carcasses, but this work continues at Texas A&M University.

After necropsy, some carcasses were saved and buried for later exhumation and curation for scientific and educational purposes and public display. For example, the long bones of sea turtles may be useful to studies of age and growth (Zug, Wynn and Ruckdeschel 1986). Damaged or mutilated skeletons are examined to determine causes of injury and death, and to confirm species identification. The carcasses are also of taxonomic value.

Systematic sampling surveys of sea turtle strandings are essential as one means of evaluating conservation and management measures such as NMFS' implementation of mandatory use of TEDs, regulations concerning petroleum platform severance through Section 7 Consultation (under the Endangered Species Act, ESA) with Minerals Management Service (MMS), petroleum companies and their salvage contractors, and Section 7 Consultations concerning the impacts of U.S. Army Corps of Engineer's dredge-fill projects. Long time-series of data are especially important in this regard, and the Galveston Laboratory's data base of strandings goes back to fall of 1985. The centralized STSSN data base for the entire southeast region goes back to 1980 (Schroeder 1988).

Debris and Entanglement

Galveston Laboratory staff served on the Texas Coastal Cleanup Steering Committee sponsored by the Center for Marine Conservation (CMC, formerly The Center for Environmental Education). Galveston Laboratory stranding, salvage and entanglement-debris survey activities were coordinated with the Texas General Land Office's "Adopt-a-Beach" and "Don't Mess with Texas Beaches, "CMC's "Texas Coastal Cleanup," programs, and the Minerals Management Service's "Take Pride Gulfwide" program, as well as with an assortment of similar cleanup programs involving coastal Counties, Municipalities and Conservation organizations. Rotting carcasses of sea turtles, marine mammals, fin fishes, etc. on heavily trafficked public beaches pose unique "debris" problems and require special kinds of cleanup methods. Unusually high numbers of carcasses of animals in the marine environment can be considered pollutants. On occasion, curious beachgoers mutilate sea turtle and marine mammal carcasses to obtain skulls or shells as souvenirs in violation of the ESA and Marine Mammal Protection Act (MMPA), while at the same time risking exposure to potential health hazards. Marine animals that ingest galley wastes dumped at sea may inadvertently become vectors of communicable diseases. Municipal or County beach cleanup crews may unknowingly be in violation of the ESA and MMPA when ridding the beaches of sea turtle and marine mammal carcasses. From the point of view of coastal tourism, the decaying bodies of marine animals represent unsightly nuisances that cause negative economic impacts on tourism, along with the tar and debris that

accumulate on the beaches.

Sea Turtle Rehabilitation

Live-stranded sea turtles were collected, rehabilitated, tagged and returned to their natural habitat, transferred to oceanaria, or tracked with radio- and sonic-transmitters and receivers. Eight live-stranded sea turtles were rehabilitated in fiscal year 1988. Rehabilitation also gave sea turtle biologists and cooperating veterinarians further experience in medical treatment and rehabilitation of live-stranded sea turtles.

Media coverage of major stranding events and activities of the STSSN provided greater public awareness of the plight of sea turtles and the need for their conservation.

Public Outreach

The head start facility received approximately 7,200 visitors during the fiscal year. HEART held its annual open house on 20 February 1988 and about 1,000 people visited the head start facility on that day. The Galveston Laboratory held its annual open house on 7 May 1988, and 600 visitors toured the head start facility. Other community outreach activities included slide presentations at various schools, organizations and nature clubs. Numerous packets of information on sea turtles were sent to persons requesting it. Life Studies Division staff provided scientific and technical information to Pamela Phillips, author of the book The Great Ridley Rescue, Mountain Press Missoula, Montana, and to

Sherron Barrow and Harry Bailey authors of the "Teachers' Curriculum Guide to Ridley's Road to Rights-a documentary video". Barrow and Bailey are Science teachers in Spring School District, North Harris County, Houston, TX, and guided production of the documentary video by students of Bammel Middle School in that district.

CHANGES IN DIVISION STAFF

The current permanent staff of the Life Studies Division working on sea turtles includes:

Charles Caillouet

Marcel Duronslet

Clark Fontaine

Sharon Manzella

Dickie Revera

Theodore Williams

Throughout fiscal year 1988 a number of temporary staff members resigned or were reassigned to the Fishery Ecology Division, including Warren Brasher, Rosemary Breedlove, Bridgette Davidson, Matthew Dickinson, Valerie Graves and Michael Pena. The current temporary staff of the Life Studies Division working on sea turtles includes:

STSSN

Robert Barber

Jane Boslet

Mervin Doucet

Alan Gielen

Robert Heinly

Gerilyn Jewett-Smith

Sherman Jones

Mark King

Kirstin Loop

Pam Plotkin

Kerry Stanley

Anthony Williams

<u>HEAD START</u>

George O'Donohoe

Billy Ross

Erich Stabenau

Carolin Turner

Jo Ann Williams

George Wyatt

PUBLICATIONS AND REPORTS IN FISCAL YEAR 1988

PUBLICATIONS

Caillouet, C. W., Jr., M. J. Duronslet, A. M. Landry, Jr. and E. K. Stabenau. 1988. Stockpiling sea turtle carcasses. Marine Turtle Newsletter No. 42, p. 11-12.

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ACKNOWLEDGEMENTS

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Fauna and Flora (CITES). Dr. Edward Klima and Walter Nelson provided programmatic support and guidance throughout the year.

The Kemp's ridley eggs from year-classes 1987 and 1988 were made available to the NPS through the efforts of Rene Marquez M. (INP, Mexico), Jack Woody and Richard Byles (FWS, Albuquerque, NM), Pat Burchfield (Gladys Porter Zoo, Brownsville, Texas), and their staffs. The efforts of Dr. Milford Fletcher (NPS, Santa Fe, NM), John Hunter, Jenny Bjork, Donna Shaver and staff (NPS, Corpus Christi, Texas) in incubation, hatching and "imprinting" phases were appreciated.

HEART (Help Endangered Animals - Ridley Turtles), a non-profit, special committee of the Piney Woods Wildlife Society of North Harris County College, Houston, TX, chaired by Mrs. Carole Allen, funded graduate assistantships, provided food for the 1987 and 1988 year-classes, and continued to lend the Galveston Laboratory an electronic balance for weighing turtles. HEART received donations totaling $12,143 during fiscal year 1988 in support of Kemp's ridley research and conservation. Included among the donors were Exxon Company USA, the Kempner Foundation of Galveston, TX, Piney Woods Wildlife Society, and the general public.

We thank Dr. Robert Jones, Director, University of Texas, Marine Science Institute, Port Aransas, TX, who provided the R/V LONGHORN for the offshore release in May 1988. The assistance of Anthony Amos, LONGHORN Captain Don Gibson and his crew in the release also was appreciated.

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We thank those affiliated with the oceanaria, universities, and agencies for holding captive-reared Kemp's ridleys older than 1 year.

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Table 1. Summary of "imprinted" Kemp's ridley sea turtle hatchlings received, and captive-reared survivors tagged and released or relocated, by year-class[a/].

"Imprinted" Hatchlings Received					Tagged Turtles[b/]					
			No.		Held back[c/]		Released		Recovered	
Year-class	Inclusive dates	"Imprinting" location	Alive	Dead	No.	%	No.	%	No.	%
1978	6 July-3 August	PINS[d/]	1,854	1	41	2	1,267	68	50	4
	11 August	RN[e/]	1,226	0	1	<1	752	61	25	3
			3,080	1	42		2,019	65	75	4
1979	26 June-23 July	PINS	1,656	2	66	4	1,279	77	21	2
		RN	187	1	100	53	66	87	0	0
			1,843	3	166	9	1,345	73	21	2
1980	24 June-14 July	PINS	1,608	4	0		1,526	95	81	5
	7 July	RN	207	3	0		197	95	5	3
			1,815	7	0		1,723	95	86	5
1981	24 July-22 August	PINS	1,864	1	0		1,639	88	51	3
1982	6 July-16 August	PINS	1,524	0	28	2	1,325	87	156	12
1983	8 July-12 August	PINS	230		2	<1	172	75	10	6
	8 July	RN	20		0		18	90	1	6
			250	0	2	<1	190	76	11	6

Table 1. (continued).

"Imprinted" Hatchlings Received					Tagged Turtles[b/]					
			No.		Held back[c/]		Released		Recovered	
Year-class	Inclusive dates	"Imprinting" location	Alive	Dead	No.	%	No.	%	No.	%
1984	24 July-27 July	PINS	1,441	106	61	4	1,017	71	23	2
1985	9 July-7 August	PINS	1,684	8	12	1	1,534	91	102	7
1986	6 July-26 July	PINS	1,759	0	50	3	1,680	96	8	<1
1987	6 July-23 July	PINS	1,278	4	50		1,100	86		
1988	13 July-20 July	PINS	925	0						
1978-1988		PINS	15,823	126	310	2	12,539	76	502	4
1978-1985		RN	1,640	4	101	6	1,033	63	31	3
Total			16,538	130	411	2	13,702	75	533	4

[a/]As of 30 September 1988.

[b/]Allocation of data between PINS and RN "imprinting" categories may be incorrect for year-classes 1978-1980, and should be considered only an approximation.

[c/]Most transferred to other locations for extended head starting and captive propagation experiments, but some kept beyond 1 year at the Galveston Laboratory; also includes some abnormal individuals transferred to other investigators or oceanaria.

[d/]Padre Island National Seashore.

[e/]Rancho Nuevo.

Table 2. Head started Kemp's ridley sea turtles relocated to the Cayman Turtle Farm (1983), Ltd., oceanaria and universities for research in captive propagation and "super head starting," by year-class.

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag		Sex[f]	Relocation Date	Identifying physical characteristics and noteworthy events
					Tag code	Tag location[e]			
1978	Sea-Arama Marineworld, Galveston, TX	Unknown	2520 (NNA269)	None	None		F*	Feb. 1980	Right front flipper missing
			2514 (NNA240)	"	"		M*	"	
			2512 (NNA230)	"	"		F*	"	
		"	2511 (NNA262)	"	"		F*	"	Died 20 July 1988
			2510 (NNA243)	"	"		M*	"	
		"	2509 (J0051)	"	"		F*	"	
			2508 (NNA270)	"	"		F*	"	
		"	2507 (J0089)	"	"		M*	"	
1978	Miami Seaquarium Miami, FL	Unknown	NNK015	NS-5	"		M	22 Feb 79	Died June 1986
		"	NNK021	None	"		M	"	Died 8 July 1986
		"	NNK003	None	"		M	"	Died 1 July 1986
		"	NNK017 (NNK001)	RCS-3	"		M	"	Died 19 June 1986
		"	J1939	None	"		M	"	Died 1 July 1986
		"	AAL008 (NNR464)	LCS-3	No		F	"	
1979	Miami Seaquarium, Miami, FL	"	No Tag (unknown)	None	"		M	17 Sept. 1979	Right front flipper missing & notch on right edge of carapace

Table 2. (continued).

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag: Tag code	Internal, binary-coded magnetic tag: Tag location[e]	Sex[f]	Relocation Date	Identifying physical characteristics and noteworthy events
1979	Cayman Turtle Farm (1983), Ltd., Grand Cayman, BWI	Unknown	1325 (NNA301)	None	"		M	4 July 1980	Died between 9/1986-9/1987
		"	1330 (NNA302)	"	"		M	"	
		"	1320 (NNA305)	"	"		F	"	Died between 9/1985-9/1986
		"	1332 (NNA312)	"	"		M	"	
		"	1323 (NNA317)	"	"		F	"	
		"	1353 (unknown)	None	None		F	"	Nested 1986 & 1987 & 1988
		"	1349 (NNA373)	"	"		F	"	Nested 1986 & 1987 & 1988
		"	1354 (unknown)	"	"		F	"	Died between 9/1987-6/1988
		"	1355 (NNA380)	"	"		F	"	
		"	1331 (NNA383)	"	"		M	"	
		"	1322 (NNA386)	"	"		M	"	
		"	1345 (NNA387)	"	"		M	"	
		"	1356 (unknown)	"	"		M	"	
		"	1341 (NNA392)	"	"		M	"	
		"	1352 (NNA393)	"	"		M	"	Died between 9/1986-9/1987
		"	1348 (NNA394)	"	"		M	"	
		"	1326 (NNA397)	"	"		M	"	
		"	1324 (NNA319)	"	"		F	"	Nested 1986 & 1987 & 1988
		"	1370 (NNA320)	"	"		F	"	Nested 1986 & 1987 & 1988
		"	1318 (NNA322)	"	"		F	"	Nested 1986 & 1987 & 1988
		"	1344 (unknown)	"	"		F	"	
		"	1327 (NNA326)	"	"		M	"	
		"	1336 (NNA331)	"	"		F	"	Nested 1984, 1986, 1987 & 1988
		"	1358 (NNA332)	"	"		M	"	
		"	1359 (NNA347)	"	"		F	"	Died between 9/1986-9/1987
		"	1360 (NNA349)	"	"		M	"	
		"	1339 (NNA350)	"	"		F	"	Nested 1987 & 1988
		"	1357 (NNA353)	"	"		M	"	Died between 9/1985-9/1986
		"	1338 (NNA357)	"	"		M	"	Died between 9/1987-6/1988
		"	1329 (NNA361)	"	"		F	"	
		"	1346 (NNA365)	"	"		M	"	
		"	1337 (NNA367)	"	"		M	"	
		"	1347 (NNA368)	"	"		M	"	
		"	1342 (NNA371)	"	"		F	"	Escaped between 5/14/84-9/1/85

Table 2. (continued).

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag: Tag code	Tag location[e]	Sex[f]	Relocation Date	Identifying physical characteristics and noteworthy events
1982	Clearwater Marine Science Center, Clearwater, FL	9	NNK779/(NNM107)	None	D_1-2; D_2-20	RFF	M	9 Nov. 1983	
		12	(NNM251)/NNK708	"	" -33	RFF	M	"	
		9	NNK779/(NNM155)	"	" -21	"	F	"	
		12	NNK710/(NNM711)	"	" -32	"	F	"	Nested twice in June 1988, produced 2 hatchlings.
		10	No tag/NNM330	LC-3	" -34	"	M	"	
1982	Gulfarium, Fort Walton, Beach, FL	4	NNL485	None	" -2	"	M	26 Jan. 1984	Died 14 June 1987
		3	NNL298	"	" -8	"	F	"	" 7 Jan. 1988
		4	NNL476	"	" -4	"	F	"	" 20 June 1987
		20	NNQ318	"	" -9	"	M	"	" 2 July 1987
1982[g]	Cayman Turtle Farm (1983), Ltd., Grand Cayman, BWI	6	1361 (NNK009)	"	" -68	"	F	10 Jan. 1986	
		19	1362 (NNM576)	"	" -42		F	"	
		8	1363 (NNK008)	"	" -40	"	F	"	
		11	1364/(NNK001)	None	" -41	"	F	"	
		7	No tag (NNM010)	LC-3	" -64	"	M	"	Dead on arrival from Key West, FL on 1/10/1986
1982[h]	Sea-Arama Marineworld, Galveston, TX	5	NNL666	"	" -1	"	M	27 Aug. 1987	
		15	NNM703	LC-3	" -18	"	M	"	
		16	No Tag (NNM790)	"	" -17	"	M	"	
		18	No tag (NNM872)	LC-3	" -10	"	F	"	Died 28 Dec. 1987
		17	No tag (NNM835)	None	" -16	"	M	"	

Table 2. (continued).

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag: Tag code	Internal, binary-coded magnetic tag: Tag location[e]	Sex[f]	Relocation Date	Identifying physical characteristics and noteworthy events
1982[i]	Theater of the Sea, Islamorada, FL	5	NNW568/(NNL683)	None	D_1-2; D_2-69	RFF	M	16 Apr. 1985	Died 20 Jan. 1988
		10	NNW569/(NNK012)	LC-3	" -36	"	F	"	One female laid in pool-May 1988 before construction of "nesting beach"
		8	NNW563/564	LC-3	" -37	"	M	"	
		7	NNW565/566	None	" -65	"	M	"	
		6	NNW567/NNK027	"	" -66	"	F	"	
1984[j]	Audubon Park Zoo New Orleans, LA	17	AAL878/(NNT996)	"	" "	RFF, RRF	?	27 Aug. 1987	
		"	AAL877/(NNT998)	"	" "	"	"	"	
		"	AAL876/(NNV020)	"	" "	"	"	"	
1984	Bass Pro Shops, Springfield, MO	4	NNT100	LC-5	D_1-2; D_2-72	"	?	17 July 1985	
		"	NNT110	"	" "	"	"	"	
		"	NNT111	"	" "	"	"	"	
		"	NNT114	"	" "	"	"	"	
		"	NNT176	"	" "	"	"	"	Died 19 Aug. 1988
1984	Dallas Aquarium, Dallas, TX	17	NNV016	"	" "	RFF, RRF	"	28 June 1985	
		"	NNV019	"	" "	"	"	"	
1984	Marineland, Inc., St. Augustine, FL	10	AAL848/(NNT118)	"	" "	RFF	"	2 July 1985	
		"	AAL847/(NNT121)	"	" "	"	"	"	Died 15 June 1988
		"	AAL849/(NNT123)	"	" "	"	"	"	
		"	AAL850/(NNT131)	"	" "	"	"	"	
		"	AAL846/(NNT164)	"	" "	"	"	"	
		16	AAL865/(NNT043)[n]	"	" "	"	"	23 Oct. 1987	Died 23 March 1988
		"	AAL865/(NNT045)[n]	"	" "	"	"	"	

Table 2. (continued).

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag: Tag code	Internal, binary-coded magnetic tag: Tag location[e]	Sex[f]	Relocation Date	Identifying physical characteristics and noteworthy events
1984	Pan American University, South Padre Island, TX	17	NNV004	"	"	RFF, LFF, RRF, LRF	"	1 Aug. 1985	
		"	NNV006	"	"	"	"	"	
1984	Sea-Arama Marineworld, Galveston, TX	"	NNV003	"	"	LFF, RFF, RRF	"	30 Sept. 1985	
		"	NNV011	"	"	"	"	"	
		"	NNV014	"	"	"	"	"	
		16	AAL852/(NNT052)[n]	"	"	RFF	"	23 Oct. 1987	
		"	AAL851/(NNT095)[n]	"	"	"	"	"	
		8	AAL857/(NNT069)[o]	"	"	"	"	10 May 1988	PIT Tag=7F7E1B420E
		"	AAL858/(NNT070)[o]	"	"	"	"	"	PIT Tag=7F7E124B66
		"	AAL856/(NNT078)[o]	"	"	"	"	"	PIT Tag=7F7E1B421B
1984[k]	Sea Turtle, Inc., South Padre Island, TX	9	NNT004	"	"	RFF	"	1 Aug. 1985	Died 9/26/1986
		"	NNT087	"	"	"	"	"	Died June 1986
		"	NNT097	"	"	"	"	"	Released 21/4/1987
1984	Sea World of Florida, Orlando, FL	2	AAL826/(NNT136)	"	"	"	"	2 July 1985	Died 9/9/1987
		"	AAL827/(NNT140)	"	"	"	"	"	Died 7/2/1987
		"	NNT142	"	"	"	"	"	Died 13/7/1985
		"	AAL828/(NNT147)	"	"	"	"	"	
		"	AAL829/(NNT155)	"	"	"	"	"	
1984	Cayman Turtle Farm (1983), Ltd., Grand Cayman, BWI	13	NNT196	"	"	RFF, LFF	"	16 Jan. 1986	
		"	NNT244	"	"	"	"	"	
		"	NNT245	"	"	"	"	"	

Table 2. (continued).

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag: Tag code	Internal, binary-coded magnetic tag: Tag location[e]	Sex[f]	Relocation Date	Identifying physical characteristics and noteworthy events
1984	Cayman Turtle Farm (1983), Ltd., Grand Cayman, BWI	13	NNT251	LC-5	D_1-D2; D_2-72	RFF, LFF	?	16 Jan. 1986	
		"	NNT253	"	"	"	"	"	
		11	NNT207	"	"	"	"	"	
		"	NNT227	"	"	"	"	"	
		"	NNT233	"	"	"	"	"	
		"	NNT238	"	"	"	"	"	
		"	NNT254	"	"	"	"	"	
		"	NNT257	"	"	"	"	"	
		"	NNT259	"	"	"	"	"	
		"	NNT260	"	"	"	"	"	
		"	NNT262	"	"	"	"	"	
		"	NNT290	"	"	"	"	"	
1985[l]	Marineland, Inc. St. Augustine, FL	7	NNX021	RC-5	D_1-D_2; D_2-73	RFF	"	7 Jan. 1987	Died 2/1/1987
		7	NNX380	"	"	"	"	"	Died 2/8/1987
		8	NNX439	"	"	"	"	"	Died 1/30/1987
		8	NNX494	"	"	"	"	"	
		5	NNX524	"	"	"	"	"	Died 2/22/1987
		5	NNX533	"	"	"	"	"	Died 2/3/1987
		10	NNX679	"	"	"	"	"	Died 1/19/1987
		10	NNX797	"	"	"	"	"	Died 1/20/1987
1985[m]	San Antonio Zoo San Antonio, TX		NNX699	RC-5	D_1-D_2; D_2-73	RFF	?	15 Oct. 1987	
1986[m]			PPK717	N-4	D_1-D_2; D_2-74	"	"	"	
			PPK722	N-4	"	"	"	"	

[a] With the exception of turtles of the 1979 year-class sent to Cayman Turtle Farm, all turtles were "imprinted" at the Padre Island National Seashore. The 1979 year-class turtles sent to Cayman Turtle Farm were "imprinted" at Rancho Nuevo, Mexico.

[b] Clutch identification for 1978 and 1979 year-classes is unavailable. Clutch identification numbers for subsequent years were assigned to clutches by NPS at Padre Island National Seashore and were used by the NMFS SEFC Galveston Laboratory.

Table 2. (continued).

c/Numbers preceeded by three letters represent monel flipper tags applied by NMFS. Tag codes or explanations to the left represent current tag status. Tag codes in parentheses to the right represent the previous monel flipper tags that most recently have been either lost or removed. Turtles that have lost all tags are indicated as "No tag" followed by the previous tag code in parentheses if known. Untagged animals are scheduled for re-tagging with flipper tags. Tag codes separated by a slash (/) represent double-tagged turtles (i.e., on both front flippers). Sea-Arama Marineworld turtles of the 1978 year-class are tagged with orange plastic tags. All 1979 year-class turtles at Cayman Turtle Farm were doubled-tagged with medium rototags (plastic) on 14 May 1984. At that time, all but seven still had original monel tags in place; during the period 14 May 1984 to 1 September 1985, three of the seven died.

d/Miami Seaquarium turtles of the 1978 year-class were living-tagged in studies by Drs. John & Lupe Hendrickson in June 1980 and June 1981, under contract with the NMFS SEFC. All costal scutes and the 5th neural scute (N-5) were used in the studies. All 1982 year-class turtles that were "living-tagged" were tagged on left costal scute 3 (LC-3). All 1984 year-class turtles were tagged on left costal scute 5 (LC-5).

e/Manufactured by Northwest Marine Technology Inc., Shaw Island, Washington. Tags were inserted subcutaneously in the dorsal aspect of a front flipper near the distal end of the humerus, and centered in the dorsal aspect of a rear flipper. Letters identify flipper(s) used: RFF = right front flipper; LFF = left front flipper; RRF = right rear flipper; LRF = left rear flipper.

f/Sex of 1978 and 1979 year-classes at Miami Seaquarium was determined by an external, secondary sex characteristic (tail length), and by testosterone levels in blood samples taken by Dr. David Owens, TAMU. Sex of 1979 year-class turtles at Cayman Turtle Farm was obtained from a report from the farm dated 14 May 1984.* Sex of all 1982 year-class turtles is predicted sex, based on testosterone levels from blood samples taken by Dr. Owens on 10 July 1984. A question mark (?) in this column indicates that sex has not been determined.

*Sex of the 1978 year-class at Sea-Arama Marineworld was verified by Dr. Owens by laparoscopic examination (indicated by a single asterisk (*) in this column.

g/These five turtles were transferred to Cayman Turtle Farm (1983), Ltd. from Key West Municipal Aquarium, Key West FL, on 16 January 1986. They had been at Key West Municipal Aquarium since 9 November 1983. One was dead on arrival at the Cayman Turtle Farm (Original Tag NNM010).

h/These five turtles had been at Marine Life Inc., Gulfport, Mississippi, since 6 February 1984.

i/These five turtles had been at Turtle Kraals, Key West, FL since 9 November 1983.

j/These three turtles were returned to the NMFS Facility, Galveston, Texas on 31 July 1986, where they remained until transferred to Audubon Park and Zoological Gardens, New Orleans, LA, on 27 August 1987.

Table 2. (continued).

k/Two turtles transferred back to NMFS Galveston 25 September 1986. One turtle died 26 September 1986, the remaining turtle was released 21 April 1987.

l/These eight turtles were tagged with Passive Integrated Transponder (PIT) tags in the left fore flipper 1 July or 11 Nov. 1986. They were transferred to Marine Land, Inc. on 7 January 1987 to be held for an indefinite period for evaluation of the PIT Tag. The animals suffered cold shock with subsequent fungal and bacterial infections resulting in the death of 7 animals between 19 January and 8 February 1987. The one surviving turtle is apparently recovered and is growing and gaining weight.

m/These three turtles were transferred from the National Marine Fisheries Service Galveston Laboratory. They were deemed unlikely to survive in the wild because of stiffness in the shoulder joint of one or both fore flippers.

n/Transferred from New England Aquarium, Boston, MA on 23 October 1987.

o/Transferred to Sea-Arama Marineworld, from North Carolina Resource Center, Kure Beach, NC, on 10 May 1988.

NOTE: Sea Turtles, Inc., So. Padre Island, TX, currently holds two severely deformed ridleys (1 1982 year-class and 1 1984 year-class) and and Marine LIfe Inc., Gulfport, MS holds 1 1984 year-class.

Table 3. Geometric mean weighs of combined samples of Kemp's ridley sea turtles of the 1987 year-class by date.

Date	Combined samples, total no. weighed	Geometric mean of all turtles weighed
30 July 1987[a/]	251	20.1
3 September	350	48.4
24 September	355	73.7
22 October	355	126.1
19 November	355	197.8
17 December	355	290.6
14 January 1988	350	424.2
11 February	350	573.1
10 March	350	781.5
7 April	350	1,042.9
10-13 May[b/]	1,100	

[a/]Data provided by Donna Shaver, NPS.
[b/]Final weighing of all turtles before their release on 17 May 1988.

Table 4. Mean temperature, salinity and pH by raceway and month for the 1987 year-class of head started Kemp's ridley sea turtles.

Raceway	Month, Year	Temperature (n)[a/]	Salinity (n)[a/]	ph (n)[a/]
1	Jul 1987	27.2 (16)	27.3 (16)	7.4 (11)
	Aug	27.6 (30)	31.6 (28)	7.7 (23)
	Sep	25.5 (28)	33.4 (27)	7.6 (26)
	Oct	26.8 (29)	29.9 (29)	7.3 (29)
	Nov	27.0 (26)	28.0 (26)	7.2 (23)
	Dec	27.9 (29)	28.2 (29)	7.1 (29)
	Jan 1988	26.1 (31)	27.3 (31)	7.1 (31)
	Feb	26.9 (23)	27.5 (23)	7.1 (23)
	Mar	28.4 (28)	26.0 (28)	7.1 (28)
	Apr	28.8 (27)	27.2 (26)	7.0 (26)
	May	27.8 (15)	28.3 (15)	7.1 (15)
3	Oct 1987	25.5 (1)	29.0 (1)	7.3 (1)
6	Jul 1987	27.3 (12)	25.8 (12)	7.5 (10)
	Aug	28.1 (30)	30.9 (28)	7.7 (23)
	Sep	26.0 (27)	32.8 (26)	7.6 (25)
	Oct	26.9 (28)	29.4 (28)	7.5 (28)
	Nov	26.6 (26)	27.9 (26)	7.3 (23)
	Dec	27.6 (29)	28.0 (29)	7.2 (29)
	Jan 1988	26.2 (31)	27.0 (31)	7.2 (31)
	Feb	26.6 (23)	27.2 (23)	7.2 (23)
	Mar	28.3 (28)	25.9 (28)	7.2 (28)
	Apr	28.5 (27)	27.1 (26	7.1 (26)
	May	27.5 (15)	28.2 (15)	7.1 (15)
9	Jul 1987	27.0 (2)	27.5 (2)	7.8 (2)
10	Jul 1987	26.8 (8)	25.0 (8)	7.9 (6)
	Aug	28.0 (29)	31.5 (27)	7.8 (22)
	Sep	25.9 (28)	33.0 (27)	7.6 (26)
	Oct	26.2 (29)	29.1 (29)	7.6 (29)
	Nov	25.9 (25)	27.7 (25)	7.3 (22)
	Dec	26.7 (29)	27.7 (29)	7.3 (29)
	Jan 1988	25.6 (31)	26.8 (31)	7.2 (31)
	Feb	25.7 (23)	27.2 (23)	7.2 (23)
	Mar	27.4 (28)	25.7 (28)	7.2 (28)
	Apr	27.4 (27)	27.2 (26)	7.2 (26)
	May	26.7 (15)	28.2 (15)	7.2 (15)
11	Aug 1987	28.2 (28)	31.9 (26)	7.7 (21)
	Sep	25.8 (28)	33.0 (27)	7.5 (26)
	Oct	24.7 (29)	29.6 (29)	7.5 (29)
	Nov	24.9 (26)	28.0 (26)	7.3 (23)
	Dec	25.9 (29)	27.7 (29)	7.2 (29)
	Jan 1988	25.2 (31)	26.9 (31)	7.3 (31)
	Feb	25.6 (23)	27.0 (23)	7.3 (23)
	Mar	26.3 (28)	25.8 (28)	7.3 (28)
	Apr	26.6 (27)	27.2 (26)	7.2 (26)

Table 4. Continued.

Raceway	Month, Year	Temperature (n)[a/]	Salinity (n)[a/]	ph (n)[a/]
11	May 1987	26.3 (14)	28.1 (14)	7.2 (14)
12	Jul	28.0 (1)	26.0 (1)	7.3 (1)
13	Jul	28.3 (9)	25.7 (9)	7.4 (9)
	Aug	29.0 (2)	23.5 (2)	7.4 (2)
14	Jul 1987	27.6 (4)	26.5 (4)	7.4 (1)
15	Aug 1987	28.7 (28)	32.3 (26)	7.3 (21)
	Sep	26.4 (28)	33.1 (27)	7.4 (26)
	Oct	25.5 (17)	30.4 (17)	7.4 (17)
	Nov	25.9 (24)	27.9 (24)	7.5 (21)
	Dec	26.6 (29)	27.9 (28)	7.4 (29)
	Jan 1988	26.0 (31)	26.9 (31)	7.4 (31)
	Feb	26.1 (23)	26.9 (23)	7.4 (23)
	Mar	27.1 (28)	25.8 (28)	7.4 (28)
	Apr	27.4 (27)	27.1 (26)	7.4 (26)
	May	27.3 (15)	28.1 (15)	7.4 (15)
17	Oct 1987	25.3 (9)	29.0 (9)	7.4 (9)
	Nov	26.0 (1)	28.0 (1)	7.4 (1)
23	May 1987	26.6 (9)	30.6 (9)	7.2 (9)
	Jun	26.0 (27)	30.6 (27)	7.1 (27)
	Jul	26.9 (10)	31.7 (10)	7.1 (10)
25	May 1987	26.5 (9)	30.7 (9)	7.2 (9)
	Jun	26.1 (27)	31.1 (27)	7.2 (27)
	Jul	27.1 (10)	30.1 (10)	7.2 (10)

[a/]Number of observations.

Table 5. Schedule of tagging the 1987 year-class of Kemp's ridley sea turtles.

Raceway	Clutches	Living tag[a/]	Internal tag[b/]	Flipper-tag[c/]
1	1,2,3,4,5	5-6 Feb 1988	15 Jan 1988	5 April 1988
2	5,7	10,13 Feb "	"	5,14 April 1988
3	8	14,21 Feb "	16 Jan "	5,14 " "
4	7,8	29 Feb "	"	5,6 " "
5	9,18	1 Mar "	17 "	6 "
6	9,16,20	1 Mar "	"	7,14 " "
7	20	2-3 Mar "	"	14 " "
8	12,14	3 Mar "	20 Jan "	7-8 " "
9	10,14	4 Mar "	20 " "	8,12,14 " "
10	14,19	4-5 Mar "	21 " "	8 " "
11	11,13	5-6 Mar "	22 " "	13 " "
12	13,17	6,9 Mar "	23 " "	14 " "
13	6,8	9,12 Mar "	23 " "	13-14 " "
14	15	13,17 Mar "	24 " "	12 " "

[a/] Applied to right costal scute 1.

[b/] Binary-coded metal tag inserted into the left front flipper.

[c/] Inconel tag inserted into right front flipper.

Table 6. Raceway and bucket identification codes, clutch identification numbers and inconel tag numbers for the Kemp's ridley sea turtles of the 1986 and 1987 year-classes held beyond release dates for continued study.

Year-Class	Raceway/ Bucket ID[a/]	Clutch[b/]	Tag Number	Remarks
1986	1A5	1	PPK062	
	1M6	2	PPK099	
	2B2	2	PPK125	
	2F4	3	PPK195	
	2G3	3	PPK140	
	2H3	3	PPK143	
	2P6	5	PPK227	
	3A1	10	PPK240	
	3F5	10	PPK310	
	3H1	13	PPK261	
	1I5	13	PPK319	
	3K4	6	PPK326	
	4F4	13	PPK408	
	5B3	10	PPK448	
	5B5	10	PPK495	
	5F4	6	PPK502	
	6B1	8	PPK526	
	6F5	9	PPK585	
	6K5	9	PPK597	
	7C1	8	PPK623	
	7D5	8	PPK672	
	7J2	9	PPK645	
	7L5	12	PPK688	
	8F6	9	PPK760	(subsequently died)
	8L4	8	PPK781	
	9A4	7	PPK861	
	9E2	7	PPK815	
	9K5	8	PPK890	
	9O7	9	PPK845	
	9P5	6	PPK905	
	10A6	11	PPK986	
	10G5	11	PPL004	
	10I2	11	PPK949	
	10O3	12	PPK968	
	14B1	18	PPL717	(presently at San Antonio Zoo)
	14B2	18	PPL718	
	14B3	18	PPL719	
	14D3	18	PPL722	(at San Antonio Zoo)
	14E2	18	PPL724	
	14G1	18	PPL726	
	14H1	18	PPL279	
	14H5	18	PPL730	
	14I1	18	PPL731	
	14I2	18	PPL732	

Table 6. (continued)

Year-Class	Raceway/ Bucket ID[a/]	Clutch[b/]	Tag Number	Remarks
1986	14I5	18	PPL733	
	14K4	18	PPL737	
	14N6	18	PPL745	
	14O2	18	PPL742	
	14Q1	18	PPL743	
1987	13E1	8	PPR804	(died 11/23/88)
	13E2	8	PPR935	
	13D3	6	PPR905	
	13D2	6	PPR922	
	5P4	9	PPR544	
	9F2	10	PPR456	
	9G2	10	PPR591	
	9G1	10	PPR410	
	9H3	10	PPR462	
	9H4	10	PPR840	
	14P3	15	PPR862	
	14P2	15	PPR891	
	14Q1	15	PPR995	
	14P6	15	PPR980	
	7H2	20	PPS225	
	14Q2	15	PPR875	
	7I2	20	PPS243	
	7I1	20	PPS369	(died 10/26/88)
	14G1	15	PPR818	
	10B5	19	PPR537	
	705	20	PPS220	
	703	20	PPS394	
	7J5	20	PPS311	
	7I5	20	PPS251	
	7P5	20	PPS254	
	7J2	20	PPS331	
	7H3	20	PPS335	
	7H4	20	PPS214	
	7O4	20	PPS238	(died 10/5/88)
	8I5	12	PPR351	
	8J1	12	PPR204	
	14Q3	15	PPR921	
	14O6	15	PPR971	
	14P5	15	PPR885	
	14P4	15	PPR943	
	9H6	10	PPR899	
	9H5	10	PPR915	
	14P1	15	PPR838	
	9G5	10	PPR906	
	9G6	10	PPR898	
	9G4	10	PPR957	
	9F4	10	PPR547	
	9F5	10	PPR464	

Table 6. (continued)

Year-Class	Raceway/ Bucket ID[a/]	Clutch[b/]	Tag Number	Remarks
	9F6	10	PPR976	
	13F2	8	PPR889	
	13F1	8	PPR997	
	13F3	6	PPR847	
	13E4	8	PPR958	
	13E5	8	PPR890	(died 10/2/88)
	13O1	6	PPR941	
	13B3	(untagged)	held back due to small size)	
	10L5	19	PPS268	
	2L1	7	PPR789	
	2H2	5	PPR181	

[a/] The first number designates the raceway, the letter designates the bucket row and the second number the bucket column.

[b/] Used by the NPS at the Padre Island National Seashore.

Table 7. Summary of head started Kemp's ridley sea turtle release sites, dates of releases, numbers of turtles released, and flipper tag series used, by year-classes.

Year-Class	"Imprinting" location[a/]	Release site	Release Type[b/]	Release date	No. released	Flipper tag series[c/]
1978	PINS	Sandy Key, FL	O	22 Feb. 1979	135	G----
	PINS	East Cape, FL[c/]	N	"	52	G----
	PINS	East Cape, L	O	28 Feb. 1979	1	13582
	PINS	East Cape, FL	O	"	166	G----
	PINS	Sandy Key, FL	O	5 Mar. 1979	172	G----
	RN	Homosassa, FL	N	8 May 1979	751	G----, F----
	PINS	Homosassa, FL[c/]	O	"	628	G----, F----
	PINS	Padre Island, TX	O	7 July 1979	112	G----, F----
	RN	Padre Island, TX	O	"	1	G0985
	PINS	Homosassa, FL	O	3 June 1980	1	NNA260
1979	PINS	Homosassa, FL (offshore)[c/]	O	"	665	NNN---
	RN	Homosassa, FL (nearshore)	N	5 June 1980	66	NNA---
	PINS	Homosassa, FL (nearshore)[d/]	N	"	608	NNN---, NNA---
	PINS	Padre Island, TX	O	2 June 1981	5	K----
	PINS	Galveston, TX	O	28 Sept. 1981	1	J0096
1980	PINS	Padre Island, TX	O	2 June 1981	1,426	NNB---, K----
	PINS	Padre Island, TX	O	"	100	8001-8100 (inconel)
	RN	Campeche, MX	O	3 Mar. 1981	197	NNB---, K----
1981	PINS	Padre Island, TX	O	2 June 1982	1,521	NNG---, NNH---
	PINS	Sabine Pass, TX	O	14 July 1982	118	NNG---, NNH---
1982	PINS	Padre & Mustang Islands, TX	N	7 June 1983	1,159	NNL---, NNM---
	PINS	Nueces Bay, TX	I	"	96	NNL---, NNM---
	PINS	Sabine Pass, TX	O	15 July 1983	69	NNL---, NNM---

Table 7. (continued)

Year-Class	"Imprinting" location[a/]	Release site	Release Type[b/]	Release date	No. released	Flipper tag series[c/]
1982	PINS	Mustang Island, TX	O	5 June 1984	1	NNM428
1983	PINS	Mustang Island, TX	O	5 June 1984	172	NNQ---
	RN	Mustang Island, TX	O	"	18	NNQ---
1984	PINS	Padre & Mustang Islands, TX	O	21 May 1985	1,017	NNT---, NNV---
1985	PINS	Copano Bay, TX	I	22 April 1986	448	NNX---, NNY--- (inconel)
	PINS	Italian Bend, TX	I	"	22	NNX---, NNY--- "
	PINS	Port Bay, TX	I	"	49	NNX---, NNY--- "
	PINS	Padre Island, TX	O	6 May 1986	961	NNX---, NNY--- "
	PINS	Galveston Island, TX	O	23 Sept. 1986	54	NNX---, "
1986	PINS	Mustang Island, TX	O	21 April 1987	1,630	PPK--, PPL---(inconel)
	PINS	Padre Island, TX	O	17 May 1988	50	PPK---, PPL---
1987	PINS	Padre Island, TX	O	17 May 1988	1,100	PPR---, PPS---
	CAY	Padre Island, TX	O	17 May 1988	130	PPR---, PPS---
Total					13,702	

[a/] PINS = Padre Island National Seashore;
RN = at Rancho Nuevo.
CAY = Cayman Islands

[b/] I = A bay or estuarine release
N = release less than 3 nautical miles from shore
O = release greater than 3 nautical miles from shore

Table 7. (continued)

[c/] Monel tags, unless noted otherwise. For example, Inconel tags were used on the 1985 and 1986 year-classes. Each dash represents a numerical digit from 0-9; actual numerical series are not given because they were mixed. Details concerning the numerical series can be obtained from the NMFS SEFC Galveston Laboratory, 4700 Avenue U, Galveston, TX 77550 upon request.

[d/] This release included turtles also tagged with radio-transmitters (see Klima and McVey 1982; Wibbels 1984).

Table 8. Summary of recoveries of head started, tagged and released Kemp's ridley sea turtles by year-class.[a/]

Year-class	No. of recoveries	Percent of total recoveries
1978	77	13.1
1979	21	3.6
1980	86	14.6
1981	51	8.7
1982	156	26.6
1983	12	2.0
1984	23	3.9
1985	115	19.6
1986	38	6.5
1987	8	1.4
Total	587	100.0

[a/]As of 30 September 1988.

Table 9. Summary of recoveries of head started, tagged and released Kemp's ridley sea turtles of the 1978-1987 year-classes, by nation, state and recovery zone (oceanside vs bayside).[a/]

Nation/State	Oceanside	Bayside	Not reported	Total
Mexico	5	1	1	7
USA				
Texas	147	158	78	383
Louisiana	35	29	14	78
Mississippi	2	4		6
Alabama	3		1	4
Florida	21	18	12	51
Georgia	5		5	10
South Carolina		4	8	12
North Carolina	1	17	3	21
Virginia		1	1	2
Maryland		1	1	2
New Jersey	1		1	2
New York		1	1	2
France	1		1	2
Morocco		1		1
Not Reported			4	4
Total	221(37.6)[b/]	235(40.1)	131(22.3)	578(100.0)

[a/]As of 30 September 1988.

[b/]Percentage in parentheses.

Table 10. Summary of recoveries of head started, tagged and released Kemp's ridley sea turtles of the 1978-1987 year classes by method of recovery.[a/]

Recovery method	No. of recoveries	Percent of recoveries
Not reported	127	21.5
Stranded dead	149	25.4
Shrimp trawl	137	23.4
Stranded alive	103	17.6
Hook and line	31	5.3
Gill net	19	3.2
Dip net	6	1.0
Cast net	2	0.3
Swimming	8	1.4
Butterfly net[b/]	2	0.3
Beach seine	1	0.3
Crab pot	1	0.3
Oyster dredge	1	0.3
Total	587	100.0

[a/]As of 30 September 1988.

[b/]Wingnet used to catch shrimp.

Table 11. Summary of recoveries (by-catch) by shrimpers of head started, tagged and released Kemp's ridley sea turtles of the 1978-1987 year-class by nation/state.[a/]

Nation/State[b/]	Recoveries (by-catch) by shrimpers	Percent of recoveries (by-catch) by shrimpers
Mexico	4	2.9
USA		
Texas	70	51.1
Louisiana	39	28.5
Mississippi	1	0.7
Alabama	2	1.5
Florida	8	5.8
Georgia	4	2.9
South Carolina	4	2.9
North Carolina	2	1.5
Virginia	1	0.7
Not Reported	2	1.5
Total	137	100.0

[a/]As of 30 September 1988.

[b/]In which the turtles were recovered.

Table 12. Condition of head started, tagged and released Kemp's ridley sea turtles when recovered, by year-class.[a/]

Year-class	Alive	Dead	Unknown	Total
1978	65	9	3	77
1979	16	3	2	21
1980	48	17	21	86
1981	27	20	4	51
1982	97	52	7	156
1983	9	3	0	12
1984	12	11	0	23
1985	45	69	1	115
1986	21	15	2	38
1987	5	3	0	8
Total	345	202	40	587
Percent	58.8	34.4	6.8	

[a/]As of 30 September 1988.

Table 13. Number of "imprinted" hatchlings Kemp's ridley sea turtles in 10 clutches of the 1988 year-class recieved from the NPS from 13-20 July 1988.

Clutch identification no.	July 13	14	15	16	17	18	20	Total
2		42	18	21				81
3	82	15	4					101
4			83	15				98
5			70	27				97
6				90	1			91
7			86	8	2	1		97
8		38		57	2	1		98
9				70	1			71
10				102		1		103
11					77	8	3	88
Total	82	95	261	390	83	11	3	925

Table 14. Summary of mortality in eleven year-classes of "imprinted" Kemp's ridley sea turtle hatchlings during shipment to NMFS by NPS.

Year-class	Hatchlings Received by NMFS from NPS				
	Alive		Dead on arrival		Total
	No.	%[a/]	No.	%[a/]	No.
1978	3,080	99.97	1	0.03	3,081
1979	1,843	99.84	3	0.16	1,846
1980	1,815	99.62	7	0.38	1,822
1981	1,864	99.95	1	0.05	1,865
1982	1,524	100.00	0	0.00	1,524
1983	250	100.00	0	0.00	250
1984	1,441	93.15	106	6.85	1,547
1985	1,684	99.53	8	0.47	1,692
1986	1,759	100.00	0	0.00	1,759
1987	1,278	99.68	4	0.31	1,282
1988	925	100.00	0	0.00	925
Combined	17,463	99.22	130	0.78	17,593

[a/] Percentages are based on the total numbers of hatchlings received by year-class.

Table 15. Adult female Kemp's ridley sea turtles and clutches of eggs from which hatchlings of the 1988 year-class were obtained for head starting at the Galveston Laboratory[a/].

Flipper tag nos.[b/]	Carapace length, cm	Clutch identification no.[c/]	Date eggs laid	No. eggs[d/]
T1009	70.0	1	26 May 1988	90
T1035	66.0	3	26 May 1988	110
T0881	73.5	4	28 May 1988	103
T1030	67.0	5	28 May 1988	101
T1165	70.3	6	28 May 1988	99
T0123	--	7	28 May 1988	117
T0159	65.0	8	28 May 1988	103
T0242	66.0	9	28 May 1988	86
T1116	69.5	11	29 May 1988	105
T1119	75.0	12	29 May 1988	105
Total				1,019

[a/]Data provided by Donna Shaver, NPS.

[b/]Used by INP at Rancho Nuevo.

[c/]Used by INP, FWS and Gladys Porter Zoo at Rancho Nuevo.

[d/]Number of eggs incubated in each polystyrene foam box at the Padre Island National Seashore. It can be equal to or less than the number laid, because not all eggs laid by clutch were transferred to a box in every case. For example, any that accidentally touched Rancho Nuevo sand were not put into a box containing Padre Island sand.

Table 16. Clutch histories of the 1988 year-class of "imprinted" Kemp's ridley sea turtle hatchlings received from the NPS from 13-20 July 1988[a/].

Clutch identification no.	Dates Hatched	Dates "Imprinted"[b/]	Incubation period, days
1	12 July	14-16 July	48
3	11 "	13-15 "	47
4	13 "	15-16 "	47
5	12 "	15-16 "	46
6	13 "	16-17 "	47
7	12 "	15-18 "	46
8	12 "	14,16-18 "	46
9	12 "	15-16 "	46
11	15 "	16-18 "	48
12	15 "	17-19 "	48
Combined	11-15 "	13-19 "	46-48

[a/] Data provided by Donna Shaver, NPS. See Table 17 for numbers of hatchlings received by clutch.

[b/] On the beach and in the surf at the Padre Island National Seashore.

Table 17. Arithmetic mean weight (g), geometric mean weight and ranges in weight of "imprinted" Kemp's ridley sea turtle hatchlings of the 1988 year-class[a/].

Clutch identification no.	Date weighed[a/]	Age, days	No. hatchlings weighed	Arithmetic mean weight, g	Geometric mean weight, g	Range in weight, g
1	14-16 July	2-4	81	16.7	16.7	15.3-18.3
3	13-15 "	2-4	101	14.4	14.4	12.5-16.3
4	15-16 "	2-3	98	15.4	15.3	13.8-16.3
5	15-16 "	3-4	97	14.7	14.7	13.7-15.8
6	16-17 "	3-4	91	13.4	13.4	11.7-14.7
7	15-18 "	3-6	87	15.3	15.2	13.4-16.8
8	14,16-18 "	2-6	98	14.1	14.1	12.0-15.8
9	15-16 "	3-4	71	17.8	17.8	16.8-19.1
11	16-18 "	1-3	103	15.4	15.4	14.1-16.8
12	17-19 "	2-4	88	16.2	16.1	14.2-17.9
Combined	13-19 July		925	15.2	15.2	11.7-19.1

[a/]All weighed in July 1988. Data provided by Donna Shaver, NPS.

Table 18. Dates for weighings of combined samples of Kemp's ridley sea turtles of the 1987 an 1988 year-class.

Sample weighing sequence	1987 Year-class Mn/Dy/Yr	1987 Year-class No. weighed	1988 Year-class Mn/Dy/Yr[a/]	1988 Year-class No. weighed
			7/14-19/88[b/]	925
1 (hatchlings)[b/]	7/87	1282	7/29/88	50
2	7/30/87	250	8/05/88	50
3	9/3/87	350	8/12/88	50
4	9/24/87	350	8/18/88	250
5	10/22/87	350	8/19/88	50
6	11/19/87	325	8/26/88	50
7	12/17/87	325	9/02/88	50
8	1/14/88	325	9/09/88	50
9	2/11/88	350	9/23/88	50
10	3/11/88	350	9/30/88	50
11	8/7/88	350	10/07/88	50
12	5/10-13/88	1172	10/14/88	50
			10/21/88	50
			10/28/88	50
			11/04/88	50
			11/11/88	50
			11/18/88	50
			11/25/88	50
			12/02/88	50
			12/09/88	50
			12/16/88	50
			12/23/88	50
			12/30/88	50
			1/06/89	50
			1/13/89	
			1/20/89	
			1/27/89	
			2/03/89	
			2/10/89	
			2/17/89	
			2/24/89	
			3/03/89	
			2/10/89	
			3/17/89	
			3/24/89	
			3/31/89	
			4/07/89	
			4/14/89	
			4/21/89	
			4/28/89	
			5/05/89	
			5/12/89	

[a/] Dates after 30 September 1988 are proposed weighing dates.

[b/] Data provided by Donna Shaver, NPS.

Table 19. Numbers of sea turtles stranded by county, arranged in geographic order north to south, for the Texas and Southwest Louisiana coastlines, October 1987-30 September 1988.

County	State	Species						
		Loggerhead	Kemp's Ridley	Green	Hawksbill	Leatherback	Unknown	Total
Cameron	LA	2	5					7
Jefferson	TX		3			2		5
Galveston	TX	5	10			1	1	17
Brazoria	TX	2	1			1		4
Matagorda	TX	10	9				4	23
Calhoun	TX	12	10				3	25
Aransas	TX	2	4					6
Nueces	TX	32	13	8	4	1	3	61
Kelberg	TX	12					1	13
Kennedy	TX	8					1	9
Willacy	TX	3						3
Cameron	TX	10			1		3	14
TOTAL		98	55	8	5	5	16	187